# ACCEPTOR AND DONOR TRAPPING CENTERS IN BORON-DOPED CVD DIAMOND

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Although donor and acceptor levels of point defects in a range of materials such as silicon, germanium and $A_3B_5$ materials have been extensively studied using theoretical and experimental methods, the situation is somewhat different for diamond [1]. The importance of defects as trapping centers for carriers is becoming significant now that synthetic diamond is becoming a viable electronic material. Recently was shown that boron-hydrogen complexes can act as a very shallow donor in B-doped homoepitaxially grown diamond layers [2]. However in a small number of the electrically active defects have been obtained experimentally for polycrystalline B-doped CVD diamond samples.

In the present work, the B-doped diamond films prepared by HFCVD and MPCVD technique and equipped with Ni Schottky contacts were studied by isothermal Charge-based Deep Level Transient Spectroscopy [3]. A Q-DLTS spectra for one of the sample (or functional dependence $\Delta Q(\tau m)$, where $\tau m = (t2 - t1)/\ln(t2/t1)$ is the rate window, and t1, t2 are the times from the beginning of the defect discharge upon applying a charging voltage V to the sample) are shown in Figs. 1,2. It was found, that incorporated boron atoms induce in prepared diamond samples two acceptor (A, B) and one donor (C) levels (trapping centers for holes and electrons) with activation energies of $E_A = 0.33$, $E_B = 0.26$, $E_C = 0.29$ eV, and capture cross-sections $\sigma_A = 2\times10^{-14}$, $\sigma_B = 1.5\times10^{-19}$, $\sigma_C = 2\times10^{-19}$ cm$^2$, respectively. For the first time the electron (donor) trapping centers in the bulk of B-doped CVD diamond was observed and investigated by Q-DLTS method. The nature of observed defects and differences between trapping centers in HFCVD and MPCVD B-doped diamond films are discussed.

*Figure 1. Q-DLTS spectra of B-doped CVD diamond film. V – charging voltage. A, B– acceptor and C – donor trapping centers*
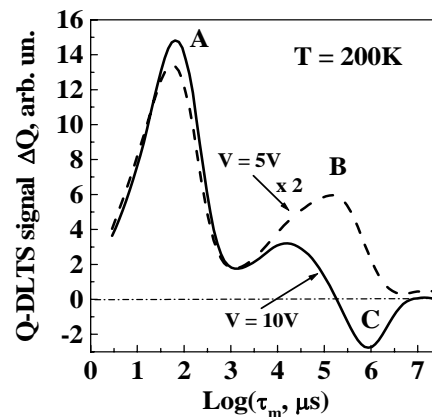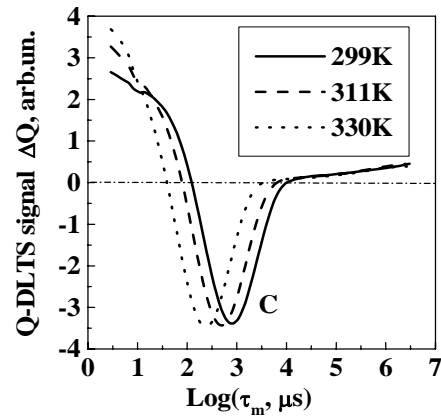
***Figure 2. Q-DLTS spectra of B-doped CVD diamond film at the range of donor trapping centers overcharge. $V_c =$ 10 V***.

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